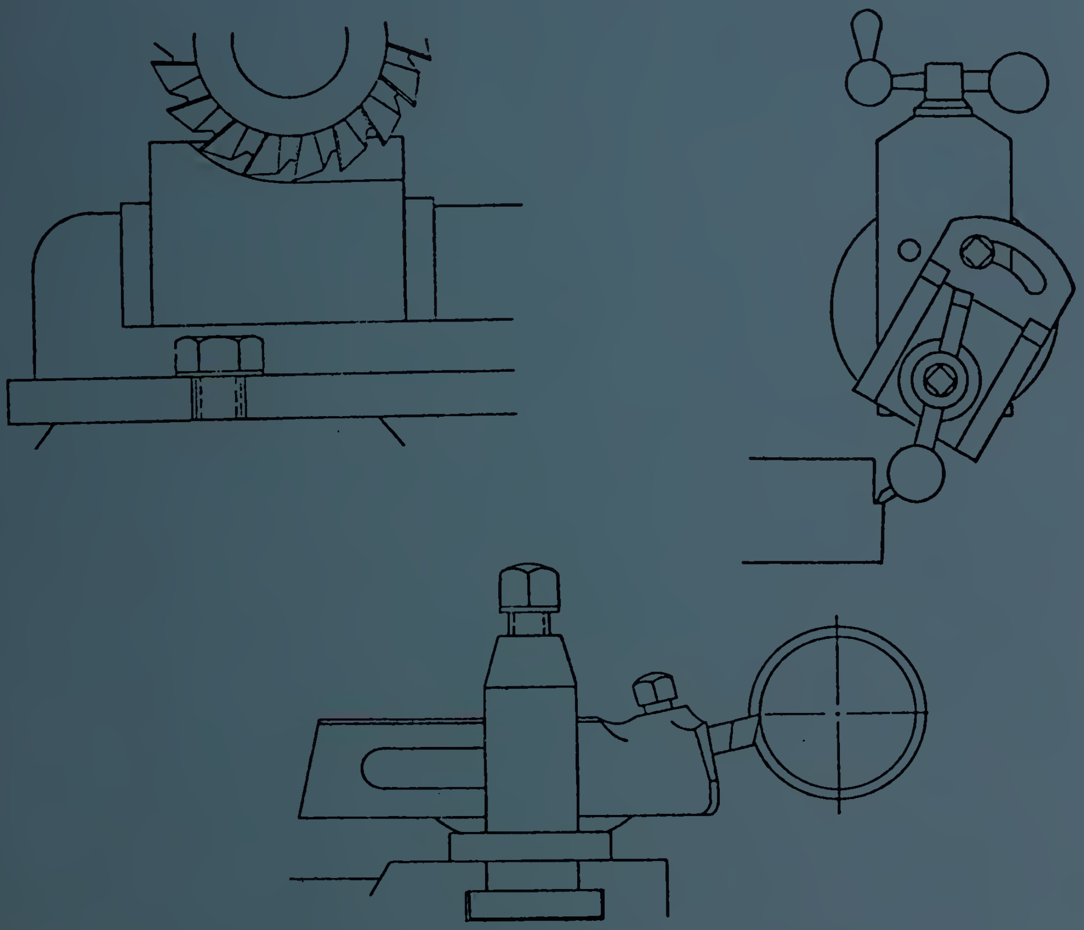
MACHINE SHOP

12-22-32



INDUSTRIAL EDUCATION

Curriculum Guide

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MACHINE SHOP

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NOTE: This Curriculum Guide is a service publication only. The Senior High School Program of Studies contains the official statement concerning Senior High School courses. The information contained in the Guide is prescriptive insofar as it duplicates that contained in the Program of Studies. There are in the Guide, however, as well as content, methods of developing the concepts, suggestions for the use of teaching aids and lists of additional reference books.

INDUSTRIAL EDUCATION

RATIONALE

Industrial Education is a program consisting of courses which provide a continuum of experiences, starting with exploratory activities in the junior high school and expanding in the high school to the development of skills related to career fields. This development of the student's skills is planned for through courses in industrial and vocational education culminating in on-the-job work experience, or entry into a job or post-high school institution for further education.

The program consists of courses ranging from those designed for an exploration of the technologies and trade areas to units of practical preparation for a career. In the process the courses develop the student's self-knowledge, talents, and skills.

For information on sequencing and course description, refer to the "Handbook In Industrial Education for Guidance to Teachers, Counsellors and Administrators".

PROGRAMS

There are two parts to the Industrial Education program. The first part consists of the I.E. 10, 20, 30 series of courses and is designed for career orientation. These courses were developed primarily for students in laboratories that utilize the multiple activity approach as found in most smaller schools, but they can be taught in unit shops as well.

The second part consists of the I.E. 12, 22, 32 series of courses and is intended for career development. The courses are planned for use in schools where facilities are available to teach specific occupational areas.

Students may progress from the I.E. 10, 20, 30 series to the 22 level courses upon meeting specified basic prerequisites or upon recommendation of their principal.

Both sections of the program focus on seven career fields. These are:

Graphic Communications
Mechanics
Construction and Fabrication
Electricity-Electronics
Personal Services
Performing Arts
Horticulture

The I.E. 10, 20, 30 courses consist of a number of one credit modules related to the career fields while the I.E. 12, 22, 32 courses consist of a number of five credit modules of specific occupational content. Completion of seven five credit modules qualifies the student for recognition by the Apprenticeship Branch for credit towards a journeyman's certificate.

It is left to the administrators of the school to offer the courses or combination of courses best suited to the needs and interests of the students and the financial resources of the district.

Courses offered at the 22 and 32 level have to meet special criteria for staff and facilities. The Industrial Education Consultant must authorize these in order to qualify the students for vocational grants.

OBJECTIVES OF INDUSTRIAL EDUCATION

The Industrial Education Program can help achieve the Goals of Schooling and Education. The course objectives are more focused and give direction to the teacher.

The objectives of Industrial Education are classified in three areas with the following purposes:

A. Personal Growth

To provide opportunities for the individual growth of the student through the development of acceptable personal and social values necessary in a productive society.

1. To provide a technical environment which motivates and stimulates individuals to discover their interests and develop personal and social responsibilities.
2. To assist in the development of positive attitudes toward safety.
3. To assist in the development of positive attitudes toward conservation and environment.
4. To assist in the development of consumer literacy.

B. Career Exploration:

To develop basic competencies, integrating cognitive and psychomotor skills to enter a family of occupations or post-secondary institutions for further education.

1. To provide exploratory experiences in the use of tools, equipment and materials appropriate to various technologies prevalent in a productive society.

2. To develop an understanding of the interrelationship of various technologies.

3. To provide a technical environment for students to synthesize their accumulated knowledge in the solution of practical problems.

4. To assist the student to develop habits that will be conductive to the establishment of a safe environment.

C. Occupational Skills:

To develop basic competencies, integrating cognitive and psychomotor skills related to families of occupations.

1. To provide safe exploratory experiences in the use of tools, energy, equipment and materials appropriate to various technologies prevalent in a productive society.

2. To develop an understanding of the interrelationships of various technologies.

3. To provide a technical environment which permits students to synthesize their accumulated knowledge in the solution of practical problems, and to assist students to develop habits that will be conducive to the establishment of a safe environment.

INDUSTRIAL EDUCATION 12, 22, 32 PROGRAM

INTRODUCTION

The Industrial Education 12, 22, 32 program is a series of modules which develop competencies leading to seven different career fields.

Entry into a career field may be gained by taking one of several introductory courses. These are:

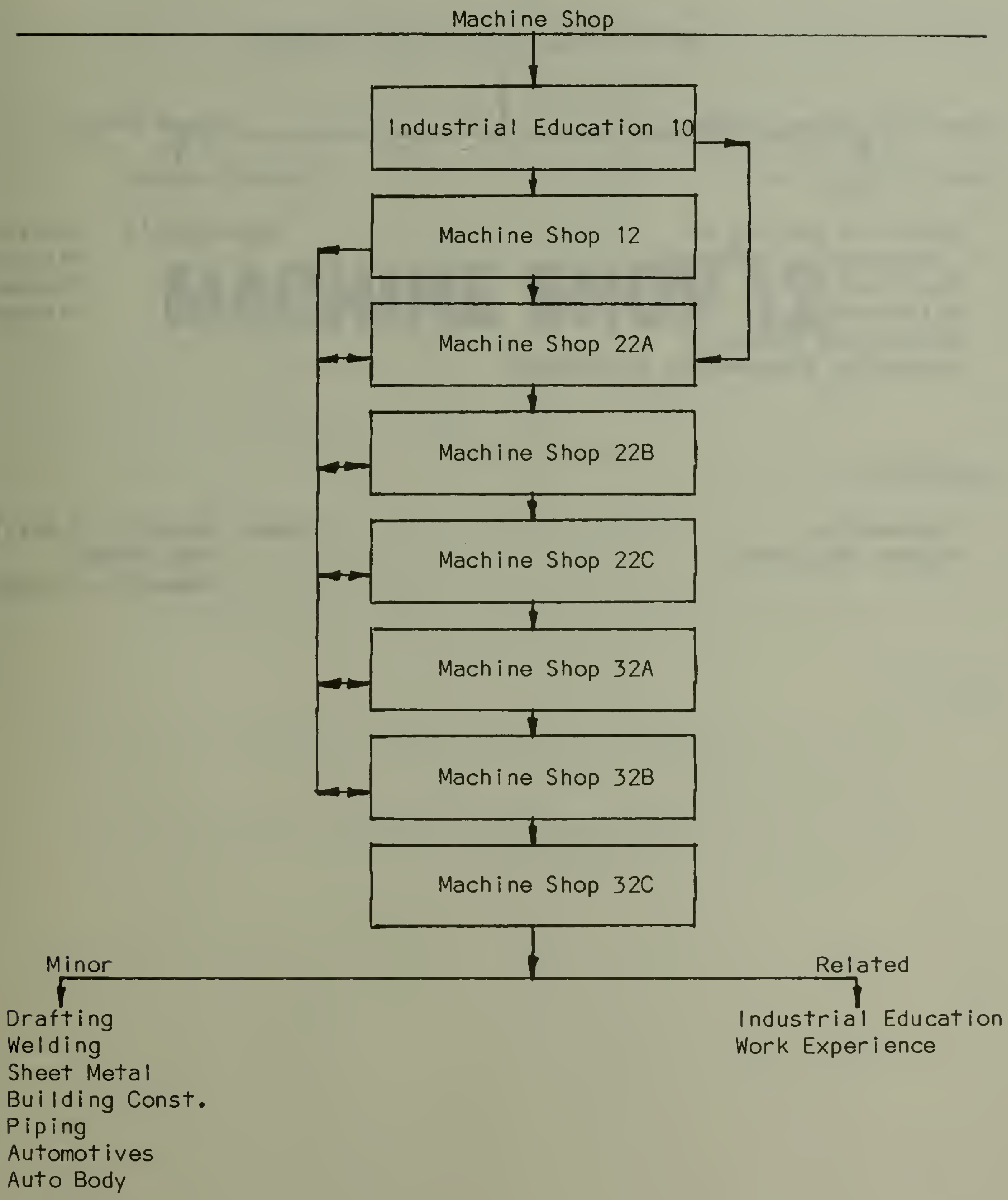
1. the "12" course designated for each major, or
2. two modules from the Industrial Education "10, 20, 30" series related to the anticipated major, or
3. one half of a "12" course. The other half would be another half "12" or a module from the "10" program. The course would be recorded as Industrial Education "10".

Following the introductory course the student may advance to the major area of study by selecting any number of five credit modules from the courses designated as "22" or "32". The scheduling and sequencing of the modules is the responsibility of the local school personnel but must be in accordance with the regulations pertaining to prerequisites.

A student registered in a second or third level course ("22" or "32") is regarded as taking a major in that course area. Having established a major the student may select courses designated as minors and in this way broaden his/her practical skill base in a career field or even several career fields. However, students must complete all the preceding modules in a major series (usually six) before taking the 32C module (exception: Beauty Culture).

CAREER FIELD

CONSTRUCTION AND FABRICATION



CAREER OPPORTUNITIES

Students taking all or most of the modules in the Machine Shop major may look forward to the following opportunities:

Machine Shop 12-22-32 (35 credits)

Post-High School Studies

N.A.I.T. or S.A.I.T.

- Materials Testing and Metallurgy Technology
- Machinist
- Millwright
- Agriculture Mechanic
- Industrial Engineering Technology

UNIVERSITY

- Engineering
- Teacher Education

Career Entry

Apprenticeship:

Journeyman's - Machinist
Millwright
Foreman
Salesman

Teach: N.A.I.T., S.A.I.T.
High School
Community College

MACHINE SHOP 12

COURSE CONTENT

MACHINE SHOP 12 (5 CREDITS)

(BENCHWORK AND LATHE OPERATIONS)

INTRODUCTION

Machine Shop 12 is designed to provide the student with theory and practice in: Safety, machine maintenance, blueprint reading, layout and measurement, benchwork, machine tools, basic metallurgy and occupational information.

OBJECTIVES

The objectives of Machine Shop 12 are:

1. To provide the students with basic machine shop orientation and safety instruction.
2. To teach the students basic skills in machine lubrication and maintenance.
3. To provide the students with an opportunity to perform practical operations using hand tools and machine tools.
4. To give the students career and occupational information.

REFERENCES

*Krar, S.F. & St. Amand J.E., Machine Shop Training (3rd ed.) 1977 McGraw-Hill Ryerson.

Hallet, Fred H. Machine Shop Theory Practice (Revised edition) MacMillan Co. of Canada, Toronto.

*Refers to primary text.

CONTENT SUMMARY:

1. Safety consciousness
   - unsafe acts and conditions

2. General Machine Shop Maintenance
   - machine lubrication
   - machine tool maintenance and repair
   - proper use and care of all tools and equipment

3. Blueprint reading
   - object visualization and drawing interpretation

4. Layout and measurement
   - measuring
   - layout

5. Benchwork
   - hand tools

6. Machine tools
   - material removal by machining

7. Metallurgy
   - steel

8. Metal working occupations
   - career opportunities

GENERALIZATION: Knowledge and safety practice is an essential consideration in all shop activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	3 hours	
1. Unsafe acts and conditions	- identify consequences of unsafe acts in the Machine Shop as they relate particularly to: - lifting - eye safety - machine safety - safe clothing - electrical wires - hot metal areas - discuss how to identify conditions which could lead to injuries on the job and identify these conditions - list benefits available under the Occupational Health and Safety Division - maintain a safe and healthy working environment		

NOTES:

TOPIC 2: GENERAL MACHINE SHOP MAINTENANCE VMS12

GENERALIZATION: Proper care and lubrication of machine tools increases their efficiency and tool life.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	3 hours	
1. Machine lubrication	- follow the manufacturers' recommended lubrication procedure - identify and select the proper lubricant for each different application		
2. Machine tool maintenance and repair	- set up and make minor repairs to equipment, when necessary		
3. Proper use and care of all tools and equipment	- develop proper operating procedures when using shop equipment - keep all cutting tools in a safe and sharpened condition		

NOTES:

TOPIC 3: BLUEPRINT READING VMS12

GENERALIZATION: A person working in a machine shop must develop the ability to read and understand technical drawings.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Blueprint Reading	The student will: - interpret and visualize objects through the use of simple project prints and other suitable drawings.	5 hours	

TOPIC 4: LAYOUT AND MEASUREMENT VMS12

GENERALIZATION: Measurement and layout are essential in the manufacture and repair of most products.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Measuring	The student will: - identify, name, describe and correctly read various measuring tools and instruments in both the imperial and metric systems: - steel rule - protractor - calipers - inside, outside - micrometers - drill gauge - vernier caliper - other measuring tools	8 hours	

TOPIC 4: LAYOUT AND MEASUREMENT (continued) VMS12

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
2. Layout	- identify, name, describe and correctly use the following tools on a product requiring their use: - scriber - layout dye or blue - prick and centre punch - steel rule - dividers - template - surface plate and gauge - other layout tools		

TOPIC 5: BENCHWORK VMS12

GENERALIZATION: Materials are shaped by removing, combining and forming, using hand tools.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	30 hours	
1. Hand Tools	- name, identify and select the following hand tools for any given job: - hammers and metal stamps - screwdrivers and wrenches - hacksaws and blades - cold chisels and punches - files - abrasive cloth - taps and dies - pliers - fasteners - other hand tools - demonstrate safe working habits using hand tools		

TOPIC 6: MACHINE TOOLS VMS12

GENERALIZATION: Materials are shaped to size by using machine tools.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Machine tools	The student will: - remove material using the following machine tools on assigned projects: - lathe: - facing and centre drilling - rough and finish machining - grooving and parting - filing, polishing and de-burring - other operations - shaper: (optional) - simple operations - drilling machines: - centre drilling - drilling - countersinking - counterboring - reaming - other operations - grinders - off-hand grinding - power saws - milling machine: (optional) - simple operations - demonstrate safe working procedures while operating machines	68 hours	

NOTES:

TOPIC 7: METALLURGY VMS12

GENERALIZATION: Metallurgy is the science and technology of metals.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Steel	The student will: - demonstrate a basic understanding of the following: - production of pig iron, steel, cast iron - forging - heat treatment - testing - hardness - spark - properties of steel - harden and temper a project	3 hours	

TOPIC 8: METAL WORKING OCCUPATIONS VMS12

GENERALIZATION: Many occupations are available to students who have machine shop training.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Career Opportunities	The student will: - list occupations open to young people who have basic machine shop training - explore other related trades	2 hours	

NOTES:

MACHINE SHOP 22A

COURSE CONTENT

MACHINE SHOP 22A (5 CREDITS)

INTRODUCTION

Machine Shop 22A is designed to provide further skill training in basic machine shop theory and practice. A student can take Machine Shop 22A following the introductory courses, Industrial Education 10 or Machine Shop 12.

OBJECTIVES

The objectives of Machine Shop 22A are:

1. To provide an opportunity for students to identify conditions relevant to machine operations and surrounding areas that could lead to injuries.
2. To provide the students with an activity of technical drawing interpretation as it relates to machine shop.
3. To give students hands-on experience in hand and machine operations commonly performed in a machine shop.

REFERENCES

*Krar, S.F., Oswald, J.W., St. Amand, J.E., Technology of Machine Tools, (2nd ed.) 1976 McGraw-Hill Ryerson.

McCarthy-Smith, Machine Tool Technology, 1968 McKnight and McKnight Publishers.

Feirer. Machine Tool Metal Working, 1973 McGraw-Hill Ryerson.

John R. Walker. Machine Fundamentals, Goodheart-Willcox Publishers.

*Refers to primary text.

CONTENT SUMMARY:

1. Safety and Health Hazards
   - unsafe acts
   - unsafe conditions

2. General Machine Shop Maintenance
   - machine tool maintenance and repair
   - machine lubrication
   - proper use and care of equipment

3. Blueprint Reading and Sketching
   - interpretation of drawings
   - freehand sketching
   - laying out

4. Benchwork
   - hand operations with metals

5. Metallurgy
   - cutting tools
   - aluminum and its alloys

6. Lathes
   - lathes, tools, procedures and accessories

7. Large Drill Press
   - holding devices, cutting edges, cutting speeds, drill sizes
   - safety

8. Power Saws
   - hacksaws
   - bandsaws

9. Shapers (optional)
   - advantages and disadvantages
   - speeds, feeds
   - application

10. Milling Machines (introductory)
    - horizontal milling
    - vertical milling

11. Career Planning
    - career field occupations
    - employment opportunities

GENERALIZATION: A knowledge and practice of safety is an essential consideration in all shop activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	3 hours	
1. Unsafe acts and unsafe conditions	- identify the consequences of unsafe acts in the Machine Shop as they relate particularly to: - lifting - eye safety - machine safety - safe clothing - electrical wires - hot metal areas		
	- discuss how to identify conditions which could lead to injuries on the job and be able to identify these conditions		
	- identify the benefits available under Workers' Health, Safety and Compensation and insurance plans		
	- maintain tools and machines in proper working condition and make sure that protective equipment is always in place and/or immediately available		
2. Shop Regulations	- identify all shop regulations that are in effect for his/her particular area		
	- comply to all said regulations while in a particular area		

NOTES:

TOPIC 2: GENERAL MACHINE SHOP MAINTENANCE VMS22A

GENERALIZATION: Repair, maintenance and use of machines and tools increases safety, efficiency and tool life.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	3 hours	

1. Machine tool maintenance and repair	- identify maintenance problems
	- evaluate safety conditions
	- evaluate repair procedures:
	  - individual repair
	  - shop repair
	  - warranty repair
	  - repair beyond shop facilities		

2. Machine Lubrication	- follow manufacturers' specifications for proper lubricants for each machine - use cross reference for alternate lubricants - use proper sequence for lubricating each machine		

3. Proper use and care of equipment	- use equipment according to manufacturers' specifications:
	  - identify consequences of improper feed and speed
	  - identify consequences of machine abuse
	- use proper procedures for storage		

NOTES:

TOPIC 3: BLUEPRINT READING AND SKETCHING

VMS22A

GENERALIZATION: Blueprint reading and sketching is a graphic language fundamental to industry and used extensively in layout work.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	10 hours	
1. Blueprint Reading	- study blueprints and drawings and visualize the shape and size of objects		
	- identify each part		
	- list required materials for each part		
	- evaluate hand and machine processes needed to produce each part		
2. Sketching	- use accepted sketching methods for: - views - line formations e.g. object lines hidden lines centre lines dimension lines extension lines notes and symbols - letters and numbers		
	- sketch selected parts prior to fabrication and use working drawings		
3. Laying out	- choose proper side of material - flat, clean surface - straight sides from which to measure		
	- use layout dye		
	- use proper techniques for laying out lines and circles		

GENERALIZATION: Skills required for benchwork operations are fundamental and necessary for the general machinist.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Benchwork	The student will: - develop skills in the following operations relevant to well chosen projects and machine shop assignments: - hack sawing - reaming - filing - tapping - threading - polishing - hand drilling - chiseling - punching - inspecting - assembling	10 hours	

NOTES:

TOPIC 5: METALLURGY VMS22A

GENERALIZATION: Metallurgy is the science and technology of metals.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	5 hours	
1. Cutting tools	- identify the chemical and physical properties of: - high carbon steel - high speed steel - carbides - evaluate advantages and disadvantages of the above for cutting tools such as: - drills - reamers - taps and dies - lathe cutters - milling cutters - files - saw blades - chisels		
2. Aluminum and its alloys	- study the production of aluminum - evaluate characteristics of aluminum and its alloys: - physical properties - heat treating techniques - develop acceptable machining techniques		

NOTES:

TOPIC 6: LATHES

VMS22A

GENERALIZATION: The lathe is the basic tool of the machine industry and uses power to remove and shape metal.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES

1. Lathes, tools, procedures and accessories	The student will:
	- review cutting theory
	- become familiar with:
	  - kinds and care of lathe cutters
	  - cutting terms
	  - lathe tool grinding
	  - cemented carbide tools (theory only)
	  - action of cutting tools
	- perform lathe operations such as:
	  - centering
	  - drilling and centre drilling
	  - facing
	  - turning
	  - filing and polishing
	  - shoulder turning
	  - other
	- use lathe accessories and procedures such as:
	  - threading tools
	  - mandrels, types and uses
	  - knurls and knurling
	  - chucks and chucking
	  - cutting-off tools and cutting off
	  - drills and drilling
	  - reamers and reaming
	  - boring tools and boring
	  - other
		60 hours	

NOTES:

GENERALIZATION: Large drill presses exceeding 10 mm drill diameter are used in most industrial machine shops and must be handled safely.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES

1. Large drill press	The student will:
	- calculate and set speeds and feeds on imperial and metric machines
	- sharpen drills
	- select appropriate drills
	  - fractional
	  - number
	  - letter
	  - metric
	- use various drill holding devices
	- use different types of drill presses
	- use special hold down devices
	- use safe procedures
		3 hours	

NOTES:

GENERALIZATION: Power saws are used when material to be cut exceeds the practical use of a hand hacksaw.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Power hacksaws and/or power bandsaws	The student will: - be familiar with: - all working parts - cutting blades as to size, material and teeth - proper tension for different blades - proper cutting speeds - coolants for sawing - use proper methods for holding different shapes of metal while sawing - use safe methods for all cutting operations including vertical bandsawing - be aware of other types of cut-off saws	2 hours	

NOTES:

TOPIC 9: SHAPERS (OPTIONAL) VMS22A

GENERALIZATION: Power shapers use a reciprocating motion of a single cutter to remove metal.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Power shapers	The student will: - evaluate advantages and disadvantages compared to other machines such as: - milling machines - planers - slotters - calculate speeds and feeds (imperial and metric) - use different shaped cutting tools - perform operations such as: - square a block - shape an angular surface - cut keyways and grooves - other operations - practice safety for operations	5 hours	

NOTES:

TOPIC 10: MILLING MACHINES (INTRODUCTORY) VMS22A

GENERALIZATION: Milling machines cover a wide variety of operations and use revolving cutters to remove metal.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Milling Machines: - horizontal - vertical	The student will: - evaluate advantages and disadvantages of milling machines - be familiar with control and safety of milling machines - be familiar with simple cutters and procedures for basic operations in horizontal and vertical milling	20 hours	

TOPIC 11: CAREER PLANNING VMS22A

GENERALIZATION: Machining and related occupations form part of the large field of construction and fabrication

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Career field occupations	The student will: - study the various construction and fabrication occupations relevant to machining: - list entry requirements to each occupation - list entry requirements to related courses at technical schools - evaluate Alberta apprenticeship program	4 hours	
2. Employment opportunities	- study employment opportunities for: - machine shop students - related occupations - tour machine shops (optional)		

MACHINE SHOP 22B

COURSE CONTENT

MACHINE SHOP 22B (5 CREDITS)

(LATHE, MILLING AND GRINDING OPERATIONS)

INTRODUCTION

Machine Shop 22B continues from the experience of the 22A module with theory and practice in advanced lathe work, the introduction of the milling operation and surface grinding operations.

OBJECTIVES

The objectives of Machine Shop 22B are:

1. To continue the emphasis of safe working conditions and working habits.
2. To provide increased skills in lathe work.
3. To provide basic milling theory and practice.
4. To introduce the student to various grinding procedures.

REFERENCES

*Krar, S.F., Oswald, J.W., St. Amand, J.E., Technology of Machine Tools, (2nd ed.) 1976 McGraw-Hill Ryerson.

McCarthy-Smith, Machine Tool Technology, 1968 McKnight and McKnight Publishers.

Feirer. Machine Tool Metal Working, 1973 McGraw-Hill Ryerson.

John R. Walker. Machine Fundamentals, Goodheart-Willcox Publishers.

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*Refers to primary text.

CONTENT SUMMARY:

1. Safety and Health Hazards
   - unsafe acts and conditions

2. General Machine Shop Maintenance
   - machine tool maintenance and repair
   - machine lubrication
   - proper use and care of equipment

3. Blueprint Reading, Sketching and Estimating
   - interpretation of drawings
   - sketching
   - estimating

4. Metallurgy
   - cutting tools
   - copper and its alloys

5. Lathes
   - lathe operations

6. Milling Machines
   - horizontal milling
   - vertical milling

7. Surface Grinding Machines
   - grinding operations

8. Fasteners
   - mechanical and bonded

9. Broaching
   - broaching keyways and hole shapes

10. Mating Parts
    - machining of mating parts

11. Career Planning
    - career field occupations
    - employment opportunities

TOPIC 1: SAFETY AND SHOP REGULATIONS VMS22B

GENERALIZATION: A knowledge and practice of safety is an essential consideration in all shop activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	3 hours	
1. Unsafe acts and unsafe conditions	- identify the consequences of unsafe acts in the Machine Shop as they relate particularly to: - lifting - eye safety - machine safety - safe clothing - electrical wires - hot metal areas		
	- discuss how to identify conditions which could lead to injuries on the job and be able to identify these conditions		
	- identify the benefits available under Workers' Health, Safety and Compensation and insurance plans		
	- maintain tools and machines in proper working condition and make sure that protective equipment is always in place and/or immediately available		
2. Shop Regulations	- follow all shop regulations that are in effect for his/her particular area		
	- comply to all said regulations while in a particular area		

NOTES:

TOPIC 2: GENERAL MACHINE SHOP MAINTENANCE VMS22B

GENERALIZATION: Proper care, and maintenance of tools and machines increases their efficiency and life.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	3 hours	

1. Machine tool maintenance and repair	- identify maintenance problems
	- evaluate safety conditions
	- evaluate repair procedures:
	  - individual repair
	  - shop repair
	  - warranty repair
	  - repair beyond shop facilities		

2. Machine Lubrication	- follow manufacturers' specifications for proper lubricants for each machine - use cross reference for alternate lubricants - use proper sequence for lubricating each machine		

3. Proper use and care of equipment	- use equipment according to manufacturers' specifications:
	  - identify consequences of improper feed and speed
	  - identify consequences of machine abuse
	- use proper procedures for storage		

NOTES:

TOPIC 3: BLUEPRINT READING, SKETCHING AND ESTIMATING VMS22B

GENERALIZATION: Interpretation of technical drawings is essential to the making, fitting, and assembling of machine parts.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	15 hours	
1. Blueprint Reading	- interpret technical drawings involving thread specifications: - O.D. and T.P.I. - thread series - external or internal - class of fit - hand of thread - blind hole - tap drill size		
	- interpret technical drawings involving: - fastener types - keys, keyways and keyseats - other fasteners aids (washers, nuts, pins, rivets)		
	- interpret technical drawings involving: - class of fits - tolerances		
	- interpret technical drawings for correct assembly procedures (introduction)		
2. Sketching	- use acceptable sketching methods to sketch selected threaded parts and use the sketch as a working drawing		

NOTES:

TOPIC 3: BLUEPRINT READING, SKETCHING AND ESTIMATING (continued) VMS22B

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	- sketch mating parts and dimension with proper tolerances for a particular class of fit		
3. Estimating	- evaluate a technical drawing's bill of materials		
	- do an estimate of material costs for a selected project		

TOPIC 4: METALLURGY VMS22B

GENERALIZATION: Metallurgy is the science and technology of metals.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	5 hours	
1. Copper and its alloys	- study the production of copper		
	- evaluate characteristics of copper and its alloys: - physical properties - heat treating techniques		
	- develop acceptable machining techniques		
2. Cast Iron	- study the types of cast iron castings		
	- develop acceptable machining techniques		

NOTES:

TOPIC 5: LATHES

GENERALIZATION: The lathe is the basic tool of the machine industry and uses power to shape metal.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Lathe Operations	The student will: - perform lathe operations such as: - threading: - external: unified metric - internal: unified metric - face plate operations - button centering - dial indicator procedures - taper turning (three methods) - other operations - perform all necessary calculations for the above	60 hours	

NOTES:

TOPIC 6: MILLING MACHINES VMS22B

GENERALIZATION: Knowledge and proper operation of milling machines for cutting metals to shape is essential to the machinist's trade.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Milling Machines: - horizontal - vertical	The student will: - use various work holding attachments safely - identify the purpose of special milling attachments - identify, classify, select and give the purpose for various cutters and cutter holding devices - calculate and set imperial and metric milling speeds and feeds	20 hours	

TOPIC 7: SURFACE GRINDING MACHINES VMS22B

GENERALIZATION: Knowledge and operation of surface grinders is essential for grinding materials to accurate tolerances.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Surface grinding operations	The student will: - have a basic knowledge of: - parts and accessories - wheel care and identification - holding devices - grinding fluids - types and grades of finishes - flat surface grinding - produce suitable products using proper machining techniques	6 hours	

TOPIC 8: FASTENERS VMS22B

GENERALIZATION: Knowledge of the selection and application of a wide range of fastening devices is essential to the fabrication of machine projects.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES

1. Mechanical and bonded	The student will:
	- identify and give the purpose for various types of mechanical fasteners such as:
	  - threaded
	  - non-threaded
	  - head styles
	  - pointed styles
	  - driving presses
	  - washers, nuts, pins
	  - springs, rivets
	- describe other types
	  - soldering
	  - welding
	  - bonding
	  - others
	- describe the general rules for good fastening
		2 hours	

NOTES:

TOPIC 9: BROACHING

GENERALIZATION: Broach cutting is an essential part of the machinist's trade.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES

1. Broaching key ways and hole shapes	The student will:
	- define the process of broaching
	- describe the methods for driving a broach
	  - arbor press
	  - hydraulic press
	  - special machines
	- broach a keyway in a project following the proper machining procedures
	- identify a variety of other internal broached shapes including splines
		2 hours	

TOPIC 10: MATING PARTS

GENERALIZATION: Complex machines depend on functioning mating parts which must be machined to precise tolerances

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES

1. Machining of mating parts	The student will:
	- demonstrate an understanding of:
	  - limits, fits and tolerances
	  - running and sliding fit
	  - location
	  - force or shink fits
		2 hours	

TOPIC 11: CAREER PLANNING VMS22B

GENERALIZATION: Machining and related occupations forms part of the large field of construction and fabrication.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	2 hours	
1. Career field occupations	- study the various construction and fabrication occupations relevant to machining - list entry requirements to each occupation - list entry requirements to related courses at technical schools - evaluate Alberta apprenticeship program		
2. Employment Opportunities	- study employment opportunities for: - machine shop students - related occupations - tour machine shops (optional)		

NOTES:

MACHINE SHOP 22C

COURSE CONTENT

MACHINE SHOP 22C (5 CREDITS)

(ADVANCED MACHINING)

INTRODUCTION

In Machine Shop 22C the content and practice advance to precision measuring and machining. Continued emphasis is placed on safety and machine maintenance. More advanced technical drawing interpretation leads to theory on metallurgy and metal cutting and practice in advanced machining operations.

OBJECTIVES

The objectives of Machine Shop 22C are:

1. To reinforce the need for equipment maintenance and safety.
2. To provide for interpretation of more advanced technical drawings.
3. To provide information on cutting tool shape, chip formation and tool life.
4. To provide experience in advanced machining operations.

REFERENCES

*Krar, S.F., Oswald, J.W., St. Amand, J.E., Technology of Machine Tools, (2nd ed.) 1976 McGraw-Hill Ryerson.

Oberg, E. and F.D. Jones. Machinery's Handbook, (17 edition) The Industrial Press, 93 Worth Street, New York.

Porter, H.W.; Lascoe, O.D. and Nelson, C.A. Machine Shop Operations and Setups, American Technical Society, Chicago, Illinois, 60637.

Feirer John; Machine Tool Metal Working, McGraw-Hill Ryerson.

Fred Nicholson Henry Ford Trade School; Shop Theory, Webster Division, McGraw-Hill Ryerson.

*Refers to primary text.

CONTENT SUMMARY:

1. Safety and Shop Regulations
   - unsafe acts and unsafe conditions
   - shop regulations

2. General Machine Shop Maintenance
   - machine lubrication
   - machine tool maintenance and repair
   - proper use and care of all tools and equipment

3. Blueprint Reading, Sketching and Design
   - sketching techniques

4. Metallurgy
   - steel and its alloys
   - metal finishes

5. Physics of Metal Cutting
   - chip formation
   - cutting tool geometry
   - tool life and the effect of temperature and friction
   - cutting fluids

7. Milling Machines
   - horizontal and vertical milling operations

8. Grinding Machines
   - grinding machine operations

9. Career Opportunities
   - career field occupations
   - employment opportunities

TOPIC 1: SAFETY AND SHOP REGULATIONS VMS22C

GENERALIZATION: A knowledge and practice of safety is an essential consideration in all shop activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	3 hours	
1. Unsafe acts and unsafe conditions	- identify the consequences of unsafe acts in the Machine Shop as they relate particularly to: - lifting - eye safety - machine safety - safe clothing - electrical wires - hot metal areas		
	- discuss how to identify conditions which could lead to injuries on the job and be able to identify these conditions		
	- identify the benefits available under Workers' Health, Safety and Compensation and insurance plans		
	- maintain tools and machines in proper working condition and make sure that protective equipment is always in place and/or immediately available		
2. Shop Regulations	- follow all shop regulations that are in effect for his/her particular area		
	- comply to all said regulations while in a particular area		

NOTES:

TOPIC 2: GENERAL MACHINE SHOP MAINTENANCE VMS22C

GENERALIZATION: Proper care, and maintenance of tools and equipment is essential to their life and efficiency.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	3 hours	
1. Machine Lubrication	- identify the various types of lubricants recommended for any particular machine tool - before operating any machine tool, check all lubrication points and lubricate as required		
2. Machine tool maintenance and repair	- before starting, and during any operation of a machine tool, be alert for any malfunction that may be evident. - report malfunction to teacher for appropriate action and repair		
3. Proper use and care of all tools and equipment	- use all hand tools and equipment as instructed - ensure that his/her immediate work area is clean and well organized - return all tools and equipment to their proper places in a clean condition - report any broken or lost tools to the teacher		

NOTES:

TOPIC 3: BLUEPRINT READING, SKETCHING AND DESIGN VMS22C

GENERALIZATION: The ability to produce quick, accurate and clear sketches contributes greatly to the communication of technical ideas.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	10 hours	
1. Sketching Techniques: - straight lines - circles and arcs - proportion	- produce sketches of machine parts appropriate to theory being studied and projects being fabricated - interpret technical drawings emphasizing spur gears and their calculations		

TOPIC 4: METALLURGY VMS22C

GENERALIZATION: Metallurgy is the science and technology of metals.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	5 hours	
1. Steel and its alloys	- identify the various steel specification systems - describe the various methods used to produce alloy steels - describe the effects of the various alloying elements on steel		
2. Metal Finishes	- identify the various metal finishing processes such as: - barrel finishing - vibratory finishing - abrasive belt finishing - polishing - buffing		

TOPIC 5: PHYSICS OF METAL CUTTING VMS22C

GENERALIZATION: The most important part of a metal machining operation is the spot where the cutting tool meets the work piece.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	5 hours	
1. Chip Formations	- describe the principle of how metal is cut: - plastic flow - shear plane and angles - action at chip tool interface - chip types formed		
2. Cutting tool geometry	- describe cutting tool geometry - recognize the differences between various shapes of cutting tools: - right hand - left hand - parting - forming - other		
3. Tool life and the effect of temperature and friction	- identify conditions of metal cutting which will effect tool life such as the effect of: - cutting speed - feed - rake angles - tool wear - vibration and chatter - identify the effects of increased temperature and friction when related to a cutting tool		
5. Cutting Fluids	- identify the purpose and application of cutting fluids		

TOPIC 6: LATHES

VMS22C

GENERALIZATION: The lathe is the basic tool of the machine industry and uses power to shape metal.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Lathe Operations	The student will: - perform the following lathe operations: - threading: - external - internal - parallel - taper - trepanning - turn eccentric cams - tool post grinding - form cutting - gear blank machining - other operations	65 hours	

TOPIC 7: MILLING MACHINES

VMS22C

GENERALIZATION: Knowledge and proper operation of milling machines for cutting shape is essential to the machinist's trade.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Horizontal and Vertical milling operations	The student will: - describe the operations and principles of: - plain and simple indexing - spurgear milling - rack milling - end and face milling - flat and angular milling - slot milling - keyway milling - other operations - produce products using proper machining technique	20 hours	

GENERALIZATION: Grinding consists of forming surfaces by the use of a rotating abrasive wheel.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	10 hours	

1. Grinding Machine Operations	- identify different types of grinding machines and their purposes
	- perform the different grinding operations such as:
	  - angular grinding
	  - internal grinding
	  - simple form grinding
	  - tool grinding
	  - cut-off grinding
	  - other		

NOTES:

TOPIC 9: CAREER OPPORTUNITIES

GENERALIZATION: Machining and related occupations forms part of the large field of contruction and fabrication.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	4 hours	
1. Career field occupations	- study the various construction and fabrication occupations relevant to machining: - list entry requirements to each occupation - list entry requirements to related courses at technical schools - evaluate Alberta apprenticeship program		
2. Employment Opportunities	- study employment opportunities for: - machine shop students - related occupations - tour machine shops (optional)		

NOTES:

MACHINE SHOP 32A

COURSE CONTENT

MACHINE SHOP 32A (5 CREDITS)

(CONSTRUCTION AND FABRICATION)

INTRODUCTION

Machine Shop 32A is a relatively advanced module requiring an understanding and an ability to practice the required basic operations in a machine shop. Besides the reinforcement of the basics this module concentrates on non-ferrous metals, forms of materials, advanced turning operations, horizontal and vertical milling and grinding.

OBJECTIVES

The objectives of Machine Shop 32A are:

1. To reinforce the basics in machine shop theory and practice.
2. To introduce the student to properties and operations of non-ferrous metals.
3. To provide for advanced experience in milling.
4. To provide career information.

REFERENCES

*Krar, S.F., Oswald, J.W., St. Amand, J.E., Technology of Machine Tools, (2nd ed.) 1976 McGraw-Hill Ryerson.

Jensen. Engineering, Drawing and Design, McGraw-Hill Ryerson.

*Refers to primary text.

CONTENT SUMMARY:

1. Safety and Shop Regulations
   - unsafe acts and unsafe conditions
   - shop regulations

2. General Machine Shop Maintenance
   - machine lubrication
   - machine tool maintenance and repair
   - proper use and care of all tools and equipment

3. Blueprint Reading and Sketching
   - drawing interpretation
   - sketching
   - design

4. Metallurgy
   - non-ferrous metals

5. Materials in different forms
   - identification of stock forms

6. Lathes - advanced
   - advanced turning operations on the lathe

7. Advanced Milling Machine (optional)
   - horizontal milling
   - vertical milling

8. Grinding Machines
   - grinding machine operations

9. Career Opportunities
   - career field occupations
   - employment opportunities

TOPIC 1: SAFETY AND SHOP REGULATIONS

GENERALIZATION: A knowledge and practice of safety is an essential consideration in all shop activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	3 hours	
1. Unsafe acts and unsafe conditions	- identify the consequences of unsafe acts in the Machine Shop as they relate particularly to: - lifting - eye safety - machine safety - safe clothing - electrical wires - hot metal areas		
	- discuss how to identify conditions which could lead to injuries on the job and be able to identify these conditions		
	- identify the benefits available under Workers' Health, Safety Act and Insurance plans		
	- maintain tools and machines in proper working condition and make sure that protective equipment is always in place and/or immediately available		
2. Shop Regulations	- follow all shop regulations that are in effect for his/her particular area		
	- comply to all said regulations while in a particular area		

NOTES:

TOPIC 2: GENERAL MACHINE SHOP MAINTENANCE VMS32A

GENERALIZATION: Care and maintenance of tools and equipment is essential to their life and efficiency.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	2 hours	
1. Machine Lubrication	- identify the various types of lubricants recommended - before operating any machine tool, check all lubrication points and lubricate as required		
2. Machine tool maintenance and repair	- before starting, and during any operation of a machine tool, be alert for any malfunction that may be evident - report malfunctions to teacher for appropriate action and repair		
3. Proper use and care of all tools and equipment	- use all hand tools and equipment as instructed - ensure that his/her immediate work area is clean and well organized - return all tools and equipment to their proper places in a clean condition - report any broken or lost tools to the instructor		

NOTES:

TOPIC 3: BLUEPRINT READING AND SKETCHING VMS32A

GENERALIZATION: Blueprint reading and sketching are essential skills used for transmitting technical information.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	10 hours	
1. Blueprint Reading	- critically evaluate a number of industrial blueprints - interpret technical drawings which contain machine parts		
2. Sketching	- produce sketches of machine parts which are appropriate to the theory being studied and shop projects being fabricated		
3. Design	- design simple machine parts or projects employing sound design principles		

TOPIC 4: METALLURGY VMS32A

GENERALIZATION: Metallurgy is the science and technology of metals.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	5 hours	
1. Non-ferrous metals	- identify, machine, and heat treat metals such as: - alloys of aluminum - alloys of copper - other non-ferrous metals		

NOTES:

TOPIC 5: MATERIALS IN DIFFERENT FORMS VMS32A

GENERALIZATION: The choice of different shapes of materials increases the efficiency of production.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Materials in different forms	The student will: - identify: - bar stock - forgings - sand castings - flame cut parts - weldments and brazed assemblies - permanent mold castings - investment castings - die castings - extruded shapes - powdered metallurgy parts - stampings - spun parts - describe appropriate uses for the items listed above	2 hours	

NOTES:

TOPIC 6: LATHES - ADVANCED VMS32A

GENERALIZATION: The lathe is the basic tool of the machine industry and uses power to remove and shape metal.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	60 hours	
1. Advanced turning operations on the lathe	- continue general machining operations from previous courses - turn external left hand threads - turn internal left hand threads - turn taper threads - turn blank gears for milling - use dial indicators for remounting work - turn with faceplate mounting - other operations		

NOTES:

TOPIC 7: MILLING MACHINES (ADVANCED) VMS32A

GENERALIZATION: Milling machines use many different cutters for many different operations.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	30 hours	
1. Horizontal Milling	- perform advanced milling operations on as many of the following as possible: - bevel gear milling - helical gear milling - cams and cam milling		
2. Vertical Milling	- perform advanced milling operations on as many of the following as possible: - rotary table milling - dovetail milling - t-slot milling		

TOPIC 8: GRINDING MACHINES VMS32A

GENERALIZATION: Grinding consists of forming surfaces by the use of a rotating abrasive wheel.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	10 hours	
1. Grinding Machine operations	- perform surface and tool grinding operations		

NOTES:

TOPIC 9: CAREER OPPORTUNITIES VMS32A

GENERALIZATION: Machining and related occupations forms part of the large field of construction and fabrication.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	30 hours	
1. Career field occupations	- study the various construction and fabrication occupations relevant to machining: - list entry requirements to each occupation - list entry requirements to related courses at technical schools - evaluate Alberta apprenticeship program		
2. Employment Opportunities	- study employment opportunities for: - machine shop students - related occupations - tour machine shops (optional)		

NOTES:

MACHINE SHOP 32B

COURSE CONTENT

MACHINE SHOP 32B (5 CREDITS)

(ADVANCED MACHINERY OPERATIONS)

INTRODUCTION

Machine Shop 32B provides the students with an orientation to surface finishing, welding specifications and symbols. The students get experience in using machinery's handbook to solve various trade problems. They also learn the theory and practice of such concepts as: heat treating, jigs and fixtures, special machine operations and patents.

OBJECTIVES

The objectives of Machine Shop 32B are:

1. To reinforce desirable working habits and working conditions.
2. To introduce the students to the interpretation and use of technical specifications and other data.
3. To present to the students the theory and practice of the concept of heat treating.
4. To introduce the students to special machine operations.

REFERENCES

*Krar, Oswald, St. Amand, Technology of Machine Tools, (2nd ed.) 1976 McGraw-Hill Ryerson.

Materials Technology Lab. Manual, Vega Enterprises Inc., R.R. #3, Box 3008, Decatur, Illinois.

McCarthy - Smith. Machine Tool Technology, McKnight and McKnight Publishers.

John R. Walker. Machining Fundamentals, Goodheart-Willcox Publishers.

*Refers to primary texts.

CONTENT SUMMARY:

1. Safety and Health Hazards
   - unsafe acts
   - unsafe conditions
2. General Machine Shop Maintenance
   - machine tool maintenance and repair
   - machine lubrication
   - proper use and care of equipment
3. Blueprint Reading, Sketching and Estimating
   - surface finish symbols
   - auxiliary views
   - welding specifications
   - complex machine parts
   - handbooks and tables
   - bearings
   - estimating
4. Metallurgy
   - heat treating
   - acetylene welding
5. Jigs and Fixtures
   - jigs
   - fixtures
6. Bearings Machine Shop
7. Lathe (Advanced)
   - advanced lathe work
8. Advanced Milling Machine (optional)
   - horizontal and vertical milling operations
9. Grinding Machines
   - grinding machine operations
10. Special Machine Processes (optional)
    - special machine operations and processes
11. Patents
    - patents
12. Career Opportunities
    - career field occupations
    - employment opportunities

TOPIC 1: SAFETY AND SHOP REGULATIONS VMS32B

GENERALIZATION: A knowledge and practice of safety is an essential consideration in all shop activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	3 hours	
1. Unsafe acts and unsafe conditions	- identify the consequences of unsafe acts in the Machine Shop as they relate particularly to: - lifting - eye safety - machine safety - safe clothing - electrical wires - hot metal areas		
	- discuss how to identify conditions which could lead to injuries on the job and be able to identify these conditions		
	- identify the benefits available under Workers' Health, Safety Act and Insurance plans		
	- maintain tools and machines in proper working condition and make sure that protective equipment is always in place and/or immediately available		
2. Shop Regulations	- identify all shop regulations that are in effect for his/her particular area		
	- comply to all said regulations while in a particular area		

NOTES:

TOPIC 2: GENERAL MACHINE SHOP MAINTENANCE VMS32B

GENERALIZATION: Repair, maintenance and use of machines and tools increases safety, efficiency and tool life.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	2 hours	

1. Machine tool maintenance and repair	- identify maintenance problems
	- evaluate safety conditions
	- evaluate repair procedures
	  - individual repair
	  - shop repair
	  - warranty repair
	  - repair beyond shop facilities		

2. Machine Lubrication	- follow manufacturers' specifications for proper lubricants for each machine - use cross reference for alternate lubricants - use proper sequence for lubricating each machine		

3. Proper use and care of equipment	- use equipment according to manufacturers' specifications:
	  - identify consequences of improper feed and speed
	  - identify consequences of machine abuse
	- use proper procedures for storage		

NOTES:

TOPIC 3: BLUEPRINT READING, SKETCHING AND ESTIMATING VMS32B

GENERALIZATION: Interpretation and understanding of technical drawings is essential when machining complex machine parts.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	10 hours	
1. Surface Finish Symbols	- interpret surface finish symbols from technical drawings		
2. Auxiliary Views	- describe the purpose and relationship of auxiliary views - interpret shape and dimensioning information from auxiliary view exercises - sketch an auxiliary view		
3. Welding Specifications	- interpret welding specifications and symbols		
4. Complex Machine Parts	- interpret more complex technical drawings including: - sectional views - assembly drawings - drawings involving a greater number of parts - sketch complex drawings such as: - boring head - crane hook - tailstock assembly - other suitable projects		

NOTES:

TOPIC 3: BLUEPRINT READING, SKETCHING AND ESTIMATING (continued) VMS32B

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
5. Handbooks and Tables	- use Machinery's Handbook and American Machinists' Handbook to solve various trade problems with the use of tables, formulae, and related theory		
6. Bearings	- interpret technical drawings and tables for bearing specifications and fits		

7. Estimating	- prepare materials estimates and lists from blueprints
	- estimate the time required to complete a product
	- cost out a product considering
	  - material costs
	  - labor costs
	  - overhead
	  - profit		

TOPIC 4: METALLURGY VMS32B

GENERALIZATION: Metallurgy is the science and technology of metals.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	8 hours	

1. Heat treatment	- describe heat treatment processes such as:
	  - hardening
	  - tempering
	  - annealing
	  - normalizing
	  - case hardening
	  - other		

TOPIC 4: METTALURGY (continued) VMS32B

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
2. Acetylene Welding	- use the oxy-acetylene welding equipment safely when: - heating - cutting		

TOPIC 5: JIGS AND FIXTURES VMS32B

GENERALIZATION: Jigs and Fixtures are essential work holding devices for mass production.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	2 hours	
1. Jigs	- identify design features, methods of holding, and purpose for jigs - construct a simple drill jig project (optional)		
2. Fixtures	- identify design features, methods of holding, different machine applications and purpose of fixtures - construct a simple fixture (optional)		

NOTES:

TOPIC 6: BEARINGS VMS32B

GENERALIZATION: A knowledge of bearings and bearing fits is essential to machinists.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES

1. Bearings	The student will:
	- identify and describe types of bearings
	  - plain
	  - anti-friction
	- disassemble, clean, lubricate and assemble common bearings
	- machine projects or exercises that involve various bearing fits:
	  - shafts and bearings for plain bearings
	  - shafts and housings for plain bearings
	  - shafts and housings for anti-friction bearings
		2 hours	

NOTES:

TOPIC 7: LATHES (ADVANCED) VMS32B

GENERALIZATION: The lathe is the basic tool of the machine industry and uses power to remove and shape materials.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Advanced Lathe work	The student will: - continue with general turning exercises and projects from previous courses - turn special material such as: - nylon - stainless steel - fibre metal - plastics - others - use special turning tools (optional) such as: - carbide - ceramic - others	60 hours	

TOPIC 8: MILLING MACHINES (ADVANCED) VMS32B

GENERALIZATION: Proper operation of milling machines is essential to the machinist's trade.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Horizontal and Vertical milling operations	The student will: - perform as many of the following operations as possible: - plain and simple indexing - spur gear milling - rack milling - end and face milling - flat and angular milling - slot milling - keyway milling - other operations	25 hours	

TOPIC 9: GRINDING MACHINES VMS32B

GENERALIZATION: Grinding consists of forming surfaces by the use of a rotating abrasive wheel.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Grinding Machine Operations	The student will: - perform surface and tool grinding operations	8 hours	

TOPIC 10: SPECIAL MACHINE PROCESSES (OPTIONAL) VMS32B

GENERALIZATION: Special machining processes are used frequently to shape material.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Special machine operations and processes	The student will: - explore the use of the following: - electrical discharge machinery - electro-chemical machining - high energy metal forming - numerical control - powder metallurgy - computer programming for robot control - other techniques	2 hours	

NOTES:

TOPIC 11: PATENTS VMS32B

GENERALIZATION: Knowledge of patent information will encourage the students to use their skills and knowledge to develop new ideas.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	2 hours	
1. Patents	- identify the various ways to obtain a patent - identify the various ways to produce and market a product - design and make a project for marketing (optional)		

TOPIC 12: CAREER OPPORTUNITIES VMS32B

GENERALIZATION: Machining and related occupations form part of the large field of construction and fabrication.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:	2 hours	
1. Career field occupations	- study the various construction and fabrication occupations relevant to machining - list entry requirements to each occupation - list entry requirements to related courses at technical schools - evaluate Alberta apprenticeship program		
2. Employment Opportunities	- study employment opportunities for: - machine shop students - related occupations - tour machine shops (optional)		

MACHINE SHOP 32C

COURSE CONTENT

MACHINE SHOP 32C (5, 10 CREDITS)

INTRODUCTION

This last module in the Machine Shop major is open to students who have completed 30 credits or six modules in the major.

The 125 hours of instruction time available in this module may be used to:

a. Provide greater depth for a module taken previously. Individual students, groups of students or whole classes may elect to study an area in depth. This could be more lathe work, metallurgy, other machining or any of the modules named in the Machine Shop sequence, or

b. Engage in actual machining work supervised by the machine shop teacher or a work study coordinator and a journeyman on the job.

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